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ABSTRACT

This report presents quantitative data from an ongoing longitudinal study, the Cooperative Institutional Research Program, on degree attainment rates at institutions of higher education. The report covers national degree completion data for three time intervals--4, 6, and 9 years--broken down by institutional type, student gender, and student race. Brief introductory sections define the purpose of the study and describe the methodology. Sixteen tables and supporting text present data for: attainment rates by institutional type, gender, and race; attainment rates by high school grades and Scholastic Aptitude Test (SAT) scores; prediction of Bachelor Degree completion using different combinations of input variables; and regression analysis. The study also examines the data as they relate to historically black colleges and universities, finding few strong correlations. The final section of the report looks at some policy implications and suggests ways in which institutions can use the information provided by longitudinal studies to assess institutional performance and accountability. There are three appendixes: the first converts American College Testing (ACT) scores to SAT verbal and math equivalents; and second lists the regression variables by racial subgroups; and the third compares Cooperative Institutional Research Program retention rates with rates reported by the ACT program. (Contains 13 feferences.) (CH)

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Lisa Tsui
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by
Alexander W. Astin
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Higher Education Research Institute
Graduate School of Education
University of California, Los Angeles

September, 1996

COOPERATIVE INSTITUTIONAL RESEARCH PROGRAM

The Cooperative Institutional Research Program (CIRP) is a national longitudinal study of the American higher education system. Established in 1966 at the American Council on Education, the CIRP is now the nation's largest and oldest empirical study of higher education, involving data on some 1,400 institutions, over 8 million students, and more than 200,000 faculty. To maximize the use of these data in research and training, the CIRP was transferred to the Graduate School of Education at UCLA in 1973. The annual CIRP freshman and college student surveys are now administered by the Higher Education Research Institute at the University of California, Los Angeles, under the continuing sponsorship of the American Council on Education.

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HIGHER EDUCATION RESEARCH INSTITUTE
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Degree Attainment Rates at American Colleges and Universities: Effects of Race, Gender, and Institutional Type[1]

by

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Few topics in higher education generate more interest among more different constituent groups than retention. Students and their parents have an obvious interest in retention since attending college is of little value in career development unless the student is able to persist through completion of some degree. College and university faculty and student affairs personnel care about degree attainment because it signifies that their work with students has been successful. Degree attainment is also of great interest to administrators and admission officers because of the considerable cost of recruiting additional students to fill spaces created by dropouts. Finally, legislators and policy makers are increasingly focused on graduation rates because they see it as a measure of institutional "performance" or "accountability." Indeed, in 1991 the U.S. Congress passed the "Student Right-To-Know and Campus Security Act," which requires higher education institutions to make public their institutional retention rates, presumably in order to create better "consumer information" for prospective college students and their parents.[2]

The purpose of this study is to make generally available to the higher education community quantitative information about degree attainment rates which has heretofore not been available. Specifically, we report national degree completion figures covering three time intervals--four years, six years, and nine years--together with separate figures broken down by institutional type, gender, and race. We believe that the differential figures by race will be of particular interest given the current controversy over affirmative action and the great deal of institutional interest in issues

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[1]The authors are indebted to Linda Sax and William Korn for their assistance in many phases of this project. This study was supported in part by grants from the Exxon Education Foundation and the Ford Foundation.

[2] The terms degree attainment and degree completion are used synonymously, and in this study refer to the earning of a bachelor's degree.

relating to "diversity" and "multiculturalism." We also present information which will allow individual institutions to calculate "expected" retention rates based on the characteristics of the freshmen who enroll.

Method

The data for this study were obtained from a national sample of 365 baccalaureate-granting institutions that participated in the Cooperative Institutional Research Program's annual survey of entering freshmen in the fall of 1985 (The American Freshman: National Norms for Fall 1985). Four-year degree attainment data were obtained in the summer of 1989 by sending to the registrar at each institution rosters containing names of selected entering freshmen who had completed the 1985 survey. To minimize the work involved, an average of 100 names were selected at random from each of the institutions in the national sample. Furthermore, larger samples of students (average of 250 per institution) were selected randomly from a subsample of 159 institutions that were participating in a special national study of general education (Astin, 1993b).

Data on six-year and nine-year degree attainment rates were obtained by a similar procedure when student rosters were sent to registrars during the 1994-1995 academic year. Only those students who had not completed the bachelor's degree by 1989 were included in these lists, with the following exception: in order to obtain more reliable data by race, we added to the list all Mexican-American/Chicano, Puerto Rican, Asian-American, and American Indian students as well as 50% of all African-American students who had participated in the original 1985 survey.

Degree attainment data were eventually received on 75,752 of the 95,406 freshmen for whom information was requested (response rate of 79.4 percent). Since data were obtained on close to 100% of the students at institutions that responded to our request, "nonresponse" was entirely attributable to institutions (rather than students) that did not comply with our request. A careful comparison of curricular, financial, and other institutional data between responding and non-responding institutions within stratification cells failed to reveal any institutional self-selection

bias within stratification cells (the CIRP sample is stratified by type, control, and selectivity level; see The American Freshman: National Norms for Fall 1985).

An elaborate weighting scheme was developed which allowed us to approximate the results that would have been obtained if all baccalaureate-granting institutions from 1985 had participated and responded to our registrar's survey. This weighting scheme initially inflates the number of respondents within each institution to the total freshman enrollment by gender, then compensates for differential sampling of institutions within stratification cells. The CIRP stratification scheme compensates for any institutional sampling bias associated with institutional type, (four-year vs. university) control (public, private-nonsectarian, Roman Catholic, Protestant), race (historically black versus nonblack), and selectivity level (institutions are stratified by selectivity separately within type and control; see The American Freshman: National Norms for Fall 1985). Differential weights were also used to compensate for the oversampling of certain minority groups (see above). All data reported here are weighted to approximate the national norms for all first time, full-time entering freshmen in the fall of 1985.

Before considering the results we should acknowledge that some "dropouts" from their first institution can and do transfer to one or more other institutions and eventually complete their bachelor's degrees (for a recent comprehensive analysis of transferring, "stopping out," and the reasons for leaving one's first institution, see Avalos, 1996). We have limited this study to retention at the institution of initial entry because the Student Right-to-Know and Campus Security Act, as well as most individual institutions, define retention in this way.

Results

Table 1 shows the overall degree attainment rates using the three different time periods. Only about two in five students (39.9 percent) was able to complete a bachelor's degree within four years of entering college. This number rises by 5 percent (44.9 percent) if we allow six years for degree completion. Allowing nine years increases the rate by slightly less than one additional percent to 45.7 percent. This pattern makes it clear that allowing an additional three years beyond

the conventional six-year period makes very little difference in the overall degree attainment rate for students entering four-year colleges and universities in the United States[3].

These results reinforce the popular conception that degree completion rates in American higher education have been declining. For example, of the first-time freshmen who entered four-year institutions nineteen years earlier (in the fall of 1966), 46.7 percent (compared to 39.9 percent in Table 1) completed a bachelor's degree within four years (Astin, 1972).

Table 1
Four-year, Six-year, and Nine-year Degree Attainment Rates, By Institutional Type

Institutional Type	Unweighted n	Percent Completing Bachelor's Degree Within 4 years	6 years	9 years
Public University	20,509	34.4	39.9	40.8
Private University	16,664	69.2	71.5	72.0
Public College	11,708	30.6	37.3	38.4
Nonsectarian College	17,541	47.1	50.3	50.8
Catholic College	5,755	49.9	53.1	55.5
Protestant College	7,637	42.7	45.8	46.3
All institutions	79,814	39.9	44.9	45.7

Note: Weighted to approximate national norms for 1985 Freshmen.

Degree attainment rates vary substantially by type of institution. By far the highest nine-year rate is in the private universities (72.0 percent), with the lowest rates in the public four-year colleges (38.4 percent) and universities (40.8 percent). These differences by institutional type are no doubt partially attributable to the preparation levels of the students entering different types of institutions. For example, nearly 60 percent of the students entering private universities, compared

[3] These degree completion rates are considerably lower than those recently reported by the American College Testing Program (ACT) (Chronicle of Higher Education, 1996). In all likelihood these differences are attributable to differences in methodology: the ACT data were obtained by asking institutions to report their retention rates, whereas the findings reported here are based on actual retention data for individual students. In addition, ACT did not use differential weighing to compensate for nonresponding institutions (See Appendix C for more details).

to only about 26 percent of those entering public four-year colleges, have an A grade average from high school (Sax, Astin, Korn, & Mahoney, 1995). Similarly, while each of the three types of private four-year colleges enrolls freshmen who are better prepared than those entering at the four-year public colleges (35-39 percent versus 26 percent have an A grade average from high school), their freshmen are substantially less well-prepared than those entering private universities (60 percent have an A grade average from high school). The public university is the only type of institution that does not follow this pattern: while their entering freshmen are better prepared (40.4 percent have an A average from high school) than the freshmen at all other types of institutions except private universities, their degree attainment rates are lower than the rates at all three types of private colleges. Apparently, the relatively low degree completion rate shown by students attending public universities cannot be attributed solely to their level of academic preparation at the time of college entry.

The data in Table 1 also suggest that certain types of institutions are especially likely to prolong the time students spend in obtaining a bachelor's degree. For example, the percent difference between four-year and nine-year degree attainment rates is 6.4 and 7.8 percent, respectively, for public universities and public colleges, compared to only 2.8 for private universities.

Table 2 shows the degree attainment rates for men and women at the three different time periods. Women are more likely than men are to attain the bachelor's degree, regardless of the time period. This finding confirms and extends earlier national studies (Astin, 1971, 1975, 1982, 1993b), which have consistently shown that women, as compared with men, are more likely to complete their bachelor's degrees in four-years. These new data show that such gender differences persist over a nine-year period. The greatest gender gap in degree attainment occurs four years after college entry (6.4 percent). This differential is reduced to 5.6 percent after six years, and remains at 5.6 percent after nine years. Nine years after college entry 43.0 percent of the men have attained the bachelor's degree, a figure which still lags slightly behind the four-year rate for women of 43.2 percent.

Table 2
Four-year, Six-year, and Nine-year Degree Attainment Rates by Gender

	Percent Completed Bachelor's Degree		
	Men	Women	Total
4 years	36.8	43.2	39.9
6 years	42.2	47.8	44.9
9 years	43.0	48.6	45.7

Table 3 reveals dramatic differences in degree attainment rates by racial group. For the nine-year period, Asian-American students show by far the highest degree completion rate (57.6 percent), followed by white students (47.3 percent). African-Americans (33.9 percent) and American Indians (33.2 percent) show the lowest rates, although the rates for Puerto Rican-Americans (36.9 percent) and Mexican-American/Chicanos (39.5 percent) are also relatively low. These findings are somewhat troubling, given that all of these latter four racial/ethnic groups are already substantially underrepresented among entering college freshmen (Astin, 1982). What these differential rates show is that the underrepresentation of these minority groups among entering college freshmen is being substantially exacerbated by their relatively low degree attainment rates during the undergraduate years. In other words, the undergraduate years represent a major "leak" in the educational pipeline for students from underrepresented ethnic/minority groups.

In all likelihood, the same factors that contribute to the underrepresentation of these groups among entering college freshmen--poor academic preparation, poverty, lack of education in the parental family (Astin, 1982)--also contribute to their higher dropout rates during college.

Table 3 also compares degree attainment rates for different racial groups across the three time periods. While the differences between four-year and nine-year rates is only 4.6 percent for white students, it is substantially larger for all other groups, especially African-Americans, where the difference is 14.5 percent. Comparable differences for other underrepresented groups are only

slightly smaller: American Indian (10.3 percent), Mexican-American/Chicano (9.0 percent), and Puerto Rican-American (10.1 percent). Somewhat surprisingly, the difference for Asian-American students is also substantially larger than the difference for whites (7.4 percent vs. 4.6 percent), even though Asian-Americans have higher overall degree completion rates than whites do.

Table 3
Four-year, Six-year, and Nine-year Degree Attainment Rates by Racial Group

Racial Group	Percent Completing Bachelor's Degree Within		
	4 years	6 years	9 years
White	42.7	46.8	47.3
African-American	19.4	31.2	33.9
American Indian	22.9	30.7	33.2
Asian-American	50.2	56.6	57.6
MexicanAmerican/Chicano	30.5	38.3	39.5
Puerto Rican-American	26.8	34.6	36.9
Other	34.4	41.3	43.7

These figures have several implications. First, differences in degree completion rates between whites and members of underrepresented minority groups will be exaggerated if one looks only at four-year rates. This is especially true for African-Americans, whose nine-year rate of 33.9 percent is more than 75 percent higher than their four-year rate of only 19.4 percent. These figures also suggest, once again, that the same factors that contribute to low college attendance rates and low retention rates among underrepresented minorities also prolong the time that it takes them to complete the bachelor's degree (this explanation does not, of course, account for the relatively large number of Asian-Americans who take longer than four years to complete the degree).

Table 4
Nine-year Degree Attainment Rates by Gender and Racial Group

Racial Group	Percent Completed Bachelor's Degree Within Nine Years		
	Women	Men	Total
White	50.5	44.0	47.3
African-American	35.7	31.4	33.9
American Indian	37.2	28.2	33.2
Asian-American	57.8	57.5	57.6
Mexican-American/Chicano	38.6	40.6	39.5
Puerto Rican-American	35.0	38.9	36.9
Other	43.5	43.9	43.7

Do degree attainment rates differ by gender within race? Of particular interest is the following finding: although we have already seen that women are more likely than men are to complete the bachelor's degree within the time periods of four, six, and nine years (see Table 2), the figures in Table 4 reveal that this overall trend is not consistent across all racial groups. In terms of earning the bachelor's degree within nine years, women have higher rates than men do in the white (50.5 percent versus 44.0 percent), African-American (35.7 percent versus 31.4 percent), and American Indian (37.2 percent versus 28.2 percent) samples. By contrast, there does not appear to be much of a gender differential within the Asian-American sample: 57.8 versus 57.5 percent, respectively, for women and men. On the other hand, the nine-year degree completion rate is higher for men than for women among Mexican-American/Chicanos (40.6 percent versus 38.6 percent) and Puerto Ricans (38.9 percent versus 35.0 percent).

Do degree attainment rates differ by gender and institutional type? Table 5 provides some interesting answers to this question using nine-year degree completion rates. Clearly, women have higher rates than do men at all types of institutions. Of the six categories of institutional type, public universities show the largest gender difference (9.4 percent), followed closely by

nonsectarian four-year colleges (8.5 percent). The smallest gender differences occur at private universities and public colleges (both 3.2 percent).

Table 5
Nine-year Degree Attainment Rates by Gender and Institutional Type

Institutional Type	Percent Completing Bachelor's Degree Within Nine Years		
	Women	Men	Total
Public University	45.5	36.1	40.8
Public Four Year	39.9	36.7	38.4
Private University	73.7	70.5	72.0
Nonsectarian Four Year	55.1	46.6	50.8
Catholic Four Year	57.9	50.3	54.9
Protestant Four Year	49.6	42.3	46.3
Total	48.4	42.8	45.7

Do nine-year undergraduate degree attainment rates differ by type of institution and race? Table 6 provides some interesting answers. Quite striking is that the finding reported earlier in Table 1--that bachelor's degree attainment rates are highest at private universities (72.0 percent)--holds true for every racial/ethnic group. Nine-year completion rates at private universities range from a high of 78.1 percent for Asian-Americans to a low of 56.1 percent for American Indians. The figure of 56.1 percent is by no means "low" when one considers that overall nine-year degree attainment rates fall below this mark at all other types of institutions. Indeed, if we look at the 35 separate figures shown for other types of institutions (five institutional types by seven racial groups), only three of these figures exceed the "lowest" rate of 56.1 percent for American Indians at private universities: Asian-Americans at nonsectarian colleges (64.1 percent), whites at Catholic colleges (57.9 percent), and American Indians at Catholic colleges (61.3 percent).

Table 6
Nine-Year Degree Attainment Rates by Race and Institution Type

Racial Group	Public University	Public 4 year	Private University	Non Sect. 4-year	Catholic 4-year	Protestant 4-year	Total
White	41.8	40.6	72.0	52.9	57.9	47.8	47.3
African American	29.9	32.3	62.0	36.5	32.4	31.8	33.9
American Indian	29.8	27.7	56.1	47.0	61.3	39.4	33.2
Asian American	39.2	43.8	78.1	64.1	56.0	49.4	57.6
Mexican-American/ Chicano	29.1	50.6	71.6	45.1	23.7	31.8	39.5
Puerto Rican-American	39.9	13.4	67.7	43.6	50.4	42.8	36.9
Other	38.9	25.6	71.0	46.8	52.0	50.5	43.7
Total	40.8	38.4	72.0	50.8	54.9	46.3	45.7

Since the stratification by race and type of institution as shown in Table 6 substantially reduces the sample size upon which each of these percentages is based, the reader is forewarned that the figures for the smallest racial groups (American Indians and Puerto Rican-Americans, in particular) should be regarded with some caution. With this caution in mind, it is useful to note that the lowest figures for all groups except Mexican-American /Chicanos are found in either the public universities or public colleges. In fact, the two lowest figures for four of the groups--whites, African-Americans, American Indians, and Asian-Americans--are to be found in the public universities and public colleges.

Input Effects

Our earlier discussion of degree attainment differences by institutional type (Tables 1 and 6) suggests that some of these differences may be attributable to differential characteristics of entering freshmen. More specifically, since certain types of institutions (e.g., private universities) are much more selective than other types (e.g., public colleges), it may well be that differences in their degree completion rates are a reflection of differential characteristics belonging to entering freshmen rather than differential institutional effects.

To explore the potential effects of entering student characteristics, we have produced below a series of cross-tabulations involving the two characteristics of entering freshmen that are most frequently used in making admissions decisions: average grade in high school (HSG) and composite score (Verbal plus Mathematical) on the Scholastic Aptitude Test.[4] Let us first examine the independent effects of HSG and SAT, and then examine their joint effects on the student's chances of completing college in four, six, or nine years.

Table 7 shows the effect of high school grades on each of the three degree attainment measures. The data clearly show that school grades are indeed a major determinant of the student's chances of completing college, regardless of whether degree completion is set at four, six, or nine years. Thus, students who enter college with A grade averages are four to five times more likely to finish college than are students with C grade averages or less. Despite the relatively crude nature of our seven-letter grade categories, differences between categories are quite similar, ranging from around 7 percent to less than 11 percent. This would suggest that the relationship comes close to being linear, despite the arbitrary nature of letter grades. The interval producing the largest differences (ranging from 10.4 to 10.7 percent) is B+ to B.

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[4] ACT composite scores were converted to equivalent SAT composite scores using a procedure developed by Astin, Hensen, & Christian (1977) (See Appendix A).

Table 7
Degree Attainment Rates by Average High School Grade (HSG)

Average High School Grade	Unweighted n	Percentage of Students Who Received Bachelor's Degrees Within		
		4 years	6 years	9 years
A, A+	12,518	62.4	66.3	66.7
A-	14,703	52.4	57.5	58.1
B+	18,104	45.2	50.2	51.1
B	17,666	34.5	39.7	40.7
B-	8,195	26.8	31.9	32.8
C+	5,096	18.4	24.2	25.6
C or less	2,649	11.9	16.7	17.7

The effect of SAT composite score is shown in Table 8. Students in the highest test score interval (SAT composite of 1300 or greater) are about three times more likely to obtain a BA degree than are students in the lowest interval (below 700). Once again, the degree attainment rate differences across intervals are very similar, especially for nine-year attainment where they vary between only 8.2 and 10.4 percent. In other words, the effect of SAT on student's degree attainment, like the effect of HSG, appears to be roughly linear.

Table 8
Degree Attainment Rates by SAT Scores

SAT Verbal + Math Score	Unweighted n	Percent Completing Bachelor's Degree Within		
		4 years	6 years	9 years
1300+	4,321	73.1	76.0	76.5
1150-1299	9,314	62.8	67.1	67.5
1000-1149	13,821	52.6	57.2	57.7
850-999	13,772	41.4	46.5	47.3
700-849	8,396	30.3	35.8	36.9
Less than 700	3,693	19.3	27.4	28.7

Even larger differences in degree completion probabilities can be observed when we combine HSG and SAT. Table 9 shows comparative rates for the four-year time period. The data indicate that both HSG and SAT contribute independently to the prediction of student degree attainment. Thus, if we control for high school grades and look only at SAT differences across any row, we find a steady upward progression in retention chances as SAT increases. Similarly, if we control for SAT composite score by picking any column of data, we find a steady increase in degree completion chances as we move from the lower to the higher levels of HSG. As a matter of fact, of the 65 comparisons that are possible as we move from row to row or from column to column in Table 9, there are only five cases where increasing HSG or SAT does not lead to an increase in degree attainment chances. Interestingly, all of these "reversals" occur in the lower or upper extremes of SAT.

Table 9
Four-Year Degree Attainment Rates by High School Grades and Test Scores

Average High School Grades	SAT Verbal + Math Score					
	Less than 700	700 to 849	850 to 999	1,000 to 1,149	1,150 to 1,299	1,300 or more
A, A+	28.0 (65)	44.7 (310)	55.5 (1147)	63.7 (2425)	70.9 (2952)	80.4 (2173)
A-	28.7 (166)	41.4 (679)	51.8 (2116)	57.8 (3227)	64.8 (2706)	72.6 (1175)
B+	29.0 (530)	37.8 (1756)	46.5 (3526)	55.7 (3780)	62.3 (2028)	62.9 (584)
B	20.8 (966)	31.7 (2634)	39.4 (3851)	46.2 (2762)	51.4 (1072)	48.4 (257)
B-	17.1 (668)	25.6 (1453)	32.6 (1698)	34.8 (941)	43.9 (298)	38.5 (77)
C+	17.2 (752)	18.5 (970)	24.5 (931)	27.4 (419)	27.7 (147)	
C or less	10.5 (502)	15.8 (534)	19.3 (396)	20.8 (159)		

Note: No data are reported for cells containing fewer than 65 students; the figures in parentheses are the unweighted n's.

The absolute differences shown in Table 9 are far from inconsequential. Thus, as we move from the extreme lower left cells to the extreme upper right cells, we observe more than a sevenfold increase in the student's chances of completing college. When one compares students who have the lowest test scores and grades with those who have the highest test scores and grades, there is an absolute difference of nearly 70 percent in the student's chances of completing college. These differences would probably be even greater if we were to extend the SAT continuum in both directions, and/or extend the average HSG below C.

The differences in degree attainment rates shown in Tables 10 (six-year rates) and 11 (nine-year rates) are similar, except that students with the lowest grades and test scores show a substantial increase over what we saw with four-year rates in Table 9. What this tells us is that

students with the weakest academic preparation are the ones most likely to take longer than the traditional four years to complete the bachelor's degree.

Table 10
Six-Year Degree Attainment Rates by High School Grades and Test Scores

Average High School Grades	SAT Verbal + Math Score					
	Less than 700	700 to 849	850 to 999	1,000 to 1,149	1,150 to 1,299	1,300 or more
A, A+	43.6	49.0	59.7	67.6	73.8	82.4
A-	35.5	47.5	57.8	61.6	69.2	75.9
B+	37.9	43.4	52.2	59.9	66.3	66.9
B	29.4	37.1	44.2	52.0	57.2	53.7
B-	23.6	30.6	37.4	40.9	52.6	46.8
C+	24.4	25.4	29.5	32.4	36.1	
C or less	19.9	19.9	23.3	24.3		

Note: No data are reported for cells containing fewer than 65 students. For cell n's see Table 9.

Table 11
Nine Year Degree Attainment Rates by High School Grades and Test Scores

Average High School Grades	SAT Verbal + Math Score					
	Less than 700	700 to 849	850 to 999	1,000 to 1,149	1,150 to 1,299	1,300 or more
A; A+	49.3	49.0	60.1	67.7	74.0	82.9
A-	36.9	48.6	58.9	62.0	69.6	76.2
B+	40.0	45.1	52.6	60.6	66.8	67.7
B	30.1	37.8	45.2	52.7	57.4	54.6
B-	24.8	31.4	37.8	41.4	54.9	48.1
C+	26.2	27.0	31.3	33.3	37.5	
C or less	21.0	20.9	23.6	25.3		

Note: No data are reported for cells containing fewer than 65 students. For cell n's see Table 9.

These results make it clear that it makes little sense to examine any institution's "retention rate" without also taking into account the level of academic preparation of the students who enroll. Indeed, research suggests that at least half of the variation in degree attainment rates among institutions can be attributed to differences in HSGs and SAT scores of the students who enroll (Astin, 1996). Under these conditions, raw retention rates may unfairly penalize those institutions that admit less-well-prepared students, and bestow undeserved credit on those that are highly selective in their admissions policies. The real question of "institutional effectiveness," especially as it relates to degree completion, cannot be adequately addressed without considering the academic preparation levels of the students when they initially enroll. For this and other reasons set forth earlier by one of us (Astin, 1993a), the Federal Student Right-to-Know and Campus Security Act of 1991, which requires institutions to report raw degree completion rates without simultaneously reporting data about the students when they enrolled, should be seriously questioned. Similarly, efforts at the state level to make institutions more "accountable" by comparing their raw retention rates are misguided, at best, and perhaps even detrimental to state interest. The danger in such state policies is that they discourage institutions from enrolling relatively poorly prepared students in order that they be able to maximize their raw retention rates. In any state that strives to promote the quality of economic and social life for its citizens, being able to effectively educate the less well-prepared student should be given high priority, since such students pose the greatest risk of eventually becoming dependent on the state. All states, in other words, have a vested interest in raising the educational level of their underprepared students to the maximum. Therefore, any state policy that discourages institutions from admitting and educating underprepared students basically works in opposition to long-term best state interests.

Predicting Degree Attainment from Entering Student Data

In order for institutions to be in a better position to evaluate their own degree attainment rates, we present here a series of linear regression formulae[5] that any institution can utilize to obtain an "estimated degree attainment rate." We hasten to add that these formulae were derived using first time, full-time entering freshmen; we do not recommend using them for part-time or transfer students.

Each formula was developed with the dependent variable, degree attainment, scored as "1 (degree attained) or "0 (degree unattained)." Separate sets of formulae are presented for degree completion within four years (Table 12), six years (Table 13), and nine years (Table 14). We shall limit our discussion of how to use these formulae to Table 12 (degree completion in four years), but the procedures are identical in every case for Tables 13 and 14. The only differences are the actual coefficients which, of course, differ from table to table.[6]

We have confined our regressions to only four independent variables--average high school grade (HSG), SAT, gender, and race. Note that SAT actually includes two separate variables (verbal and math) and race includes potentially six dummy variables (white, African-American, American Indian, Mexican-American/Chicano, Asian-American, and Puerto Rican-American), bringing the total number of potential variables to ten. The tables include only those variables that added significantly ($p<.001$) to the prediction of degree attainment. Although several other entering freshmen characteristics have been shown to add significantly to the prediction of degree completion (Astin, 1993b), these ten variables (especially HSG and SAT) account for the bulk of the variance in degree completion that can be predicted from entering freshmen characteristics. Also, it is likely that most institutions already have information about these variables on their entering students. Information about other entering freshmen variables that add to the prediction of degree attainment can be obtained from the original study (Astin, 1993b). These include socio-economic status, religion, hedonism, and political orientation (see Astin, 1993b, pp.193-194).

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[5]We have also conducted similar analyses using logit and probit analyses (Dey and Astin, 1993) with virtually identical results. We present regression results here because regression is a more familiar form of multivariate analysis.

To give maximum flexibility to potential users of these formulae, and to accomodate institutions that may not have data available on all four entering student characteristics, we are reporting four different formulae for each degree completion measure: (1) HSG only, (2) HSG plus SAT, (3) HSG plus SAT plus gender, and (4) HSG plus SAT plus gender plus race. These four formulae are shown, respectively, in columns 1-4 of Table 12. Formula 1 is the simplest, employing only the student's average grade in high school. Note that high school grades must be first converted to the same coding scheme shown in footnote "a" of Table 12. (This grade conversion must be done regardless of which formula is used.)

Table 12
Predicting Bachelor's Degree Completion in 4 years
Using Different Combinations of Input Variables (N= 52,898)

	b coefficient using formula			
Input Variable	1	2	3	4
Average High School Grades	.0929	.0622	.0556	.0554
SAT Verbal		.000483	.000451	.000408
SAT Math		.000445	.000588	.000546
Gender: Female			.0813	.0803
Race: White				.0378
Race: American Indian				-.1403
Race: African-American				-.0570
Race: Mexican-American/Chicano				-.0566
Constant (a)	-.0052	-.2916	-.4376	-.2004
Multiple R	.29462	.33643	.34507	.35122

[a] High school grades coding scheme: A or A+= 8, A-=7, B+= 6, B=5, B-=4, C+=3, C=2, D=1
[b] Gender coding scheme: Female=2, Male=1
[c] Race coding scheme: White (yes=2, no=1), Black (yes=2, no=1), American Indian (yes=2, no=1), Asian-American (yes=2, no=1), Mexican-American (yes=2, no=1), Puerto Rican-American (yes=2, no =1), other (yes=2, no=1)
Note: Degree completed=1; not completed=0.

[6] All regression coefficients are statistically significant (p<.001).

Thus, to estimate a student's chances of completing a degree in four years using only high school grades, the first formula would be applied as follows:

Probability of completing a degree in four years = a + b (high school grades)

" = -.0052 + .0929 (high school grades)

For example, if a student has an average grade of A- (code = 7; see footnote "b" in Table 12), you would multiply 7 by .0929 and subtract .0052, yielding a probability of .645. In other words, roughly two-thirds of college students with a high school grade average of A- complete college within four years after entering. By contrast, if the student's average grade in high school is C- (code = 2), the probability of completing a degree in four years is 2 x .0929 minus .0052, or .181. Thus, an entering freshman with an average high school grade of C- has less than one chance in five of finishing college within four years.

Formula 2 in Table 12 is for use by institutions that have available to them both high school grades and college admissions test scores of their students. Institutions that use the ACT rather than the SAT can use the table in Appendix A to convert the ACT subtest scores into equivalent scores on the SAT verbal and SAT math tests. The use of formula 2 follows once again the usual regression formula, except in this case there are three predictor variables, each with its own coefficient. Formula number 2 thus looks like this:

Probability of completing a degree in four years = $a + b_1$ (grades) + b_2 (SATV) + b_3 (SATM)

" = -.2916 + .0622 (grades) + .000483 (SATV) + .000445 (SATM)

Let's say we have an outstanding freshman with an A- average from high school (code = 7) and SAT scores of 650 and 750, respectively, on the verbal and math tests. Multiplying each of these three input variables by its respective coefficient, summing the products, and adding the (negative) constant yields a probability of .7915. Thus, more than three-fourths of freshman who enter college with such academic credentials would be expected to earn a bachelor's degree within

four years. On the other hand, applying the same formula to a freshman who enters college with only a C average (code = 2) and SAT scores on the verbal and math tests of only 450 and 400, respectively, yields a probability of only .2282. In other words, slightly less than one student in four who enters college with such grades and test scores would be expected to complete college within four years. While the multiple correlation involving these three variables is only .336 (accounting for slightly more than ten percent of the variance in retention), these two hypothetical students have very different chances of completing a degree within four years. Thus, the student with high grades and test scores is three times more likely to complete college (79 percent) than is the student with low test scores and grades (23 percent).

Similar procedures should be followed in using formulas 3 and 4. Formula 3 is available for those institutions that also have gender data on their students, whereas formula 4 is available for those institutions that have gender as well as racial/ethnic data. An important point to remember about using gender and race data is how these variables are coded: these "dummy" variables are coded either "2 or 1," rather than the traditional 1 and 0 (see footnotes "b" and "c" in Table 12). Special attention should be paid to the racial variables, since it is essential that each student receive a score on all four race variables. In other words, a white student would receive a score of "2" on the variable Race: white and scores of "1" on the three other race variables. A student who is from some racial group other than the four shown in Table 12 should receive a score of "1" on all four race variables.

Note that the multiple correlation coefficients shown for each of the four formulas in Table 12 increase slightly with the addition of more variables (from .295 in formula 1 to .351 in formula 4). What this means is that the accuracy of the prediction is increasing as additional variables are added to the equation. Although the racial variables increase the multiple correlation by only a very slight amount (.006), the b coefficients for the four race variables suggest that race can make a potentially important difference in the student's chances of finishing college in four years. To assess the comparative advantage or disadvantage associated with being a member of one versus another of the racial groups shown in Table 12, coefficients of like sign should be subtracted, and

coefficients of opposite sign should be added. For example, among students of the same sex and with identical high school grades and test scores, a white student would have a .178 better chance of finishing college in four years than would an American Indian student (.0378 + .1403), and an African-American student would have a .083 better chance than would an American Indian student (.1403 -.0570).

Investigators wishing to compute expected retention measures for six or nine years should employ the formulae shown in Tables 13 and 14. Note, however, that the multiple correlation coefficients (R) decline as the length of time to degree completion increases. What this means, in essence, is that the most stringent measure—completing a bachelor's degree within four years—is easier to predict than the other two measures. (It also suggests that the reason why some students take more than four years may have as much to do with the institution as with the student.) This finding is consistent with a national retention study done nearly twenty years earlier (Astin 1975), which showed that students who take longer than four years to complete a bachelor's degree more closely resemble the permanent drop-outs than those who complete the degree within four years.

Table 13
Predicting Bachelor's Degree Completion in 6 years
Using Different Combinations of Input Variables (N= 52,898)

	b coefficient using formula			
Input Variable	1	2	3	4
Average High School Grades	.0889	.0604	.0545	.0545
SAT Verbal		.000382	.000354	.000340
SAT Math		.000470	.000598	.000590
Gender: Female			.0728	.0725
Race: American Indian				-.1047
Race: White				.0237
Constant (a)	.0611	-.2030	-.3337	-.2605
Multiple R	.28484	.32260	.32997	.33120

Note: See footnotes on Table 12

Table 14
Predicting Bachelor's Degree Completion in 9 years
Using Different Combinations of Input Variables (N= 52,898)

	b coefficient using formula			
Input Variable	1	2	3	4
Average High School Grades	.0875	.0597	.0540	.0538
SAT Verbal		.000374	.000346	.000347
SAT Math		.000458	.000583	.000582
Gender: Female			.0708	.0707
Race: American Indian				-.1002
Constant (a)	.0756	-.1822	-.3093	-.2073
Multiple R	.28096	.31763	.32474	.32540

Note: See footnotes on Table 12

Computing an Estimated Degree Completion Rate

Investigators desiring to compute an estimated degree completion rate for any entering cohort of students are advised to follow a four-step procedure:

1. Decide which degree completion measure is most appropriate for your purposes (Table 12, Table 13, or Table 14).
2. Choose from that table the formula (1, 2, 3, or 4) that suits the data that are currently available on your entering cohort of freshmen.
3. Using the appropriate formula, compute for each student in the cohort an estimated probability of degree completion.
4. Calculate an expected degree completion rate for the entire cohort by averaging the individual probabilities.

If mean scores for the cohort are available on the relevant input variables, the computational process can be greatly simplified, since multiple linear regression is an "additive" model. Thus, all one needs to do is to multiply each mean by its respective coefficient, sum the products, and add the "a" constant. In taking this short cut it is important to realize that means for race and gender

will range between 1.0 and 2.0. Thus, if the entering cohort includes 60 percent women, the mean for the gender variable should be 1.60. Similarly, if 85 percent of the cohort are white, the mean for Race: white should be 1.85. It should also be emphasized that the high school grade averages must be converted to the eight-point scale (see footnote "a" in Table 12) before the mean is calculated.

Evaluating Expected and Actual Degree Attainment Rates

Institutions that are highly successful at retaining their students should have actual degree attainment rates that exceed their expected rates, whereas those institutions that have ineffective retention programs would be expected to have actual degree attainment rates that fall substantially below their expected rates. Institutions with average student degree completion capacity should have expected and actual rates that are very similar. While there are no hard-and-fast rules for deciding if expected and actual rates are essentially "the same," when the difference between these rates exceeds $\pm .10$, we are approaching a discrepancy which could be viewed as significant from both a practical as well as a statistical perspective (whether such a difference is indeed statistically significant would depend upon the size of the cohort being studied and the "p" value–.05, .01, etc.–that is, the amount of risk that the investigator is willing to take in inferring that the expected and actual rates are indeed different).

Recent research on retention suggests that there are a number of "environmental" factors that are known to influence an institution's actual retention rate, over and above the influence of student input characteristics (Astin 1993b). One such factor is the student's major field. Institutions enrolling many students in fields like business, psychology, or other social sciences would be expected to have higher-than-expected retention rates, whereas those enrolling large numbers of students majoring in engineering would be expected to have lower-than-expected rates.

Another factor that increases students' degree attainment chances is living in a campus residence hall during the freshman year. Thus, institutions with required freshman residency or that house a large percentage of new students in campus residence halls would be expected to have higher-than-expected student degree completion rates, whereas purely commuter institutions would

be expected to have somewhat lower-than-expected rates. Still another positive factor is college selectivity: highly selective institutions tend to have higher-than-expected degree completion rates, while the rates of nonselective institutions tend to be lower-than-expected. Institutional size, on the other hand, tends to have a negative effect on retention.

In short, institutions that are attempting to understand why their actual and expected student degree attainment rates may differ should keep these factors in mind. It is also important to realize that selectivity, small size, and residential facilities do not necessarily create actual rates that are higher-than-expected, nor do large size, nonselectivity, or a lack of residential facilities necessarily cause the institution's actual rate to be lower-than-expected. Rather, there are tendencies for size, selectivity, and residence to affect degree completion in the manner just described (Astin 1993b).

Predicting Degree Attainment for Different Racial Groups

In order to understand more fully the factors influencing degree completion among students of different racial groups, we also performed a series of more complex regression analyses which looked not only at the effects of other entering freshmen (input) variables, but also at the possible effects of institutional and environmental characteristics. These regressions involve a total of 110 independent variables organized into blocks as follows: entering freshmen characteristics (34), bridge variables (42), type of college attended (10), and characteristics of the faculty environment and the peer environment (24). (See Appendix B for complete list of variables.) Variables within each block are permitted to enter until no additional variable within that block is capable of producing a statistically significant ($p<.0001$) reduction in the residual sum of squares, after which variables in the following block become eligible to enter. The process is repeated through all blocks until all variables that contribute significantly to the prediction of degree attainment have been controlled. Separate regressions were run for all students as well as for whites, African-Americans, Asian-Americans, American Indians, Mexican-Americans/Chicanos, and Puerto Rican-Americans. Table 15 shows the sample sizes involved in each of these regressions.

Table 15
Sample Sizes for Regressions by Individual Racial Groups

Sample	Male	Female	Total
White	12,165	12,481	24,646
African-American	1,088	2029	3,117
Asian-American	742	776	1,518
American-Indian	165	217	382
Mexican-American/ Chicano	230	289	519
Puerto Rican-American	123	119	242

Because of the very large sample sizes involved in the regressions for all students and white students, a very stringent confidence level of .0001 was used for the entry of variables in order to limit the number of variables entering. A confidence level of .01 was used in the other five regressions. Table 16 shows the number of variables entering from each block and the final multiple regression coefficient for each regression.

Table 16

	Number of Variables Entering					
Sample	Input	Bridge	College Type	College Environ	Total Variables Entering	Final R
White	16	9	4	6	35	.43
African-American	9	3	3	3	18	.43
Asian-American	3	3	2	3	11	.48
American-Indian	2	1	1	1	5	.43
Mexican-American/ Chicano	1	1	2	1	5	.44
Puerto Rican-American	2	0	1	0	3	.39

Although the multiple regression coefficients obtained in the different regressions are very similar in size, the number of variables entering each regression varies from a low of only 3 (Puerto Ricans) to a high of 36 (white regression and all student regression). Clearly, the number of variables entering each regression is a function of the size of the sample, which suggests that in the smaller samples we are experiencing a significant number of "Type II" errors (i.e., failure to identify true predictors because their coefficients did not reach statistical significance). Nevertheless, there are a number of common elements in most regressions that should be noted. These will be discussed separately under input characteristics, bridge variables, college type, and college environment.

Input Variables

Consistent with hundreds of earlier studies on college retention, the student's average grade in high school (HSG) is consistently the strongest predictor in nearly all regressions (the one exception being Puerto Rican-American students, where the simple correlation for high school grades [r=.21] was edged out by SAT Verbal [r=.23]). In the other regressions the simple correlation with high school grades ranged between .26 (white sample) and .32 (Mexican-American/Chicano sample). Other input variables that were common to the white, African-American, and Asian-American regressions included SAT-math, SAT-verbal (also in Puerto Rican-American regression), and being female. This finding reinforces our decision to include these variables in the regression tables shown earlier. It also means that most institutions already have available the most important input predictors on their entering students, thereby making it possible for them to calculate expected degree attainment rates that control for most of the degree attainment variance that can be attributable to entering student characteristics.

Other entering student characteristics that were common to several regressions include parental income (white and African-American regressions), being Roman Catholic (white and Puerto Rican-American regressions), father's education (white, African-American and American

Indian regressions), and hedonism (a negative predictor in the white, African-American, and American Indian regressions). See Astin (1993b) for a definition of hedonism.

Basically, the strongest predictors tended to appear in all or most of the separate regressions, suggesting that those personal attributes that facilitate or inhibit degree completion are very similar for students of different races.

Bridge Variables

Bridge variables are defined as those that could be considered as either input or environmental variables (Astin, 1991). Several bridge variables were common to a number of the regressions. In particular, living in a campus residence hall or dormitory during the freshmen year was a significant positive predictor in the white, African-American, and Asian-American regressions. Pursuing a career in engineering was a significant negative predictor in the white, African-American, and American Indian regressions, while receiving a grant directly from the college as part of a financial aid package was a significant positive factor in degree completion for African-American, Asian-American, and Mexican-American/Chicano students. Finally, supporting oneself through personal savings from summer work was a positive predictor for whites and African-Americans.

Type of Institution

Two institutional characteristics, in particular, had consistent but contrasting effects on student retention across several groups. Institutional selectivity, for example, had a substantial positive effect on all subgroups except Mexican-American/Chicanos, whereas attending a public university had a significant negative effect on all groups except Mexican-American/Chicanos and Puerto Rican-Americans. This latter finding is particularly interesting, since the coefficients showed a "suppressor effect" (Astin, 1991) wherein the final regression coefficient for public university was actually larger than its simple correlation. The main reason for this is that public universities tend to be more selective than other institutions. Thus, since selectivity has a positive

effect, it tends to "suppress" the true negative effect of public universities. Once selectivity is controlled, the "true" (stronger) negative effect of public universities emerges.

The only other institutional characteristic entering more than one regression was institutional size, which had a negative effect on white and Mexican-American/Chicano students. In effect, these findings suggest that students from different racial groups are affected in very similar ways by the characteristics of the institutions they attend.

College Environment

Perhaps the most interesting finding concerning college environmental characteristics is the effect of the percentage of women on the faculty, which proved to be a positive factor in degree completion among whites, African-Americans, and Asian-Americans. This finding raises some provocative questions concerning possible differences in the kinds of relationships that women versus men faculty form with their students. Certainly this finding requires more in-depth study.

Another environmental characteristic showing consistent positive effects on white, African-American, and Asian-American students is the percentage of faculty with Ph.D.s. The possible reasons for this effect are not entirely clear, although it could be that faculty who have their terminal degrees may be more accessible or more available to students than faculty who are still pursuing their graduate studies.

In sum, these findings suggest, once again, that the characteristics of the student's college environment affect students from different racial groups in very similar ways.

Historically Black Colleges and Universities

The analysis involving African-Americans produced some fascinating findings concerning the effect of Historically Black Colleges and Universities (HBCUs). The simple correlation between attending an HBCU and degree completion was -.01, indicating that African-Americans who attend HBCUs are slightly (but nonsignificantly; $p>.05$) less likely to complete their degrees in comparison to African-Americans who attend other types of institutions. However, when we

control for the student's high school grades and SAT scores at the first two steps of the regression, the standardized Beta coefficient becomes positive (Beta=.07) and highly significant (p=.0001). This Beta remains pretty much unchanged as all other input variables are controlled. What this means, in short, is that African-Americans who attend HBCUs are actually more likely to complete their degrees when they are compared with African-Americans of comparable academic preparation who attend non-HBCUs. The net benefit turns out to be about a six percent absolute improvement in the student's chances of completing the bachelor's degree.

Still more interesting results occurred when we attempted to control for the effects of college environmental characteristics. For example, when we control for institutional size, which negatively affects degree completion among African-American students, the positive effect of attending an HBCU disappears (Beta= -.01, p>.05). What this suggests is that the positive effect of HBCUs on degree completion can be entirely explained in terms of their relatively small size. In other words, it appears that there is nothing inherent in the HBCU's environment that enhances degree completion rates among African-American students other than its small size.

But there is still more to the story. College selectivity, it turns out, has a substantial positive effect on the African-American student's chances of completing the baccalaureate degree. (This finding has been reported in several earlier studies; see, for example, Astin, 1982.) When the positive effect of selectivity is controlled in the regression, the nonsignificant negative Beta for HBCUs becomes highly significant and positive! The statistical explanation for this phenomenon is as follows: since selectivity positively affects degree completion, and since HBCUs are among the least selective insitutions, not controlling for selectivity masks ("suppresses") the positive effect of HBCUs on retention. When selectivity is controlled, this positive effect is revealed. In other words, when it comes to the positive effect of selectivity on degree completion, HBCUs are "outliers." To put it another way: if we control for size but do not control for the positive effect of selectivity, one would expect the HBCUs to show a negative effect on degree completion; since they are among the least selective colleges in our data base. But instead they show no effect when only size (but not selectivity) is controlled. When selectivity is also controlled, the nonsignificant

negative effect of HBCUs becomes positive and highly significant. Indeed, the net absolute improvement in the student's retention chances turns out to be about 17 percent.

What these last findings show is that HBCUs do not follow the pattern of negative effects on retention and degree completion that is associated with other (nonblack) colleges that also happen to be nonselective. There is, in other words, something about the HBCUs' environment that enables them to overcome the usual negative effects that characterize most other nonselective institutions.

The reader should be cautioned about the practical implications of these findings for African-American students. The findings should not be interpreted simplistically to mean that a given African-American student will necessarily improve his or her chances of completing the bachelor's degree by attending an HBCU. How the chances of degree completion will be affected depends entirely on what the alternatives to the HBCU might be. For example, if the student is considering a typical non-HBCU of similar size, there is basically no difference. Indeed, if the student is considering a highly selective alternative to the HBCU, the chances of degree completion might even be worse in the HBCU. On the other hand, if the student is considering a nonselective alternative college, the chances of degree completion will probably be much better at the HBCU.

Some Possible Policy Implications

While it may be unrealistic to expect that Congress will ever amend the Student Right-to-Know and Campus Security Act to require data on expected rates, individual institutions can do much to overcome the misimpressions that this act will generate by adding information on expected retention rates to the data on actual rates that the law requires them to divulge. Colleges and universities whose actual rates are "low" because of the kinds of students who enroll are put at a particular disadvantage by this Act, and the provision of data on expected rates can go a long way toward mitigating any erroneous negative impressions that the release of data on raw retention rates might convey. Note that the law in no way limits what other information an institution may release in conjunction with its actual retention rate.

Public relations notwithstanding, virtually any institution has a stake in knowing how closely its actual rate approximates its expected rate. What educationally responsible faculty or administration would not want to know whether its students are graduating at a rate which is commensurate with their academic preparation? Some of the institutions in our sample have actual rates that are far below their expected rates (20-35 percent), even though their actual rates might be judged as acceptable in absolute terms. Even though such institutions are apparently doing a poor job of retaining their students, one wouldn't necessarily form such a conclusion just by looking at their raw retention rates. Knowing the expected rates of such institutions would not only reduce the "consumer's" chances of being misinformed; it might also motivate the institution to examine its retention policies and programs in depth and perhaps even to take some remedial action. On the other hand, the higher education community at large might learn a great deal about effective retention strategies by studying institutions whose actual rates exceed their expected rates by a substantial margin.

There is also the issue of length of time to the degree. Some institutions that seem to be performing well on one degree attainment measure may not appear to be as effective on another measure. We believe that such information can be of considerable value in institutional self-analysis and policy making. For example, there are several large public institutions in our sample whose actual rates are 20-30 percent below their expected rates when we use the most stringent measure (completing the bachelor's degree in four years) but whose actual and expected rates are almost identical when we use six-year rates. Why should this be so? What do such data tell us? Rather than dismissing such contrasts as artifacts, institutions should consider the possibility that the data have exposed some possible problem with institutional policy. For example, in the case of one large public research university in our sample where the expected four-year rate exceeds the actual rate by 27 percent, we have good reason to believe that many students take longer than four years simply because course scheduling policies in the institution (which are pretty much controlled for the convenience of the faculty) make it very difficult for students to fulfill all course requirements in four years. While most students who enroll at this highly selective university

eventually complete their degrees, taking five or six years has become the "norm." Given the soaring costs of higher education and the declining ability of states to provide adequate financial support for public institutions, for this university not to make more of an effort to help students complete their baccalaureate studies in four years would appear to be irresponsible, if not self-defeating.

The data reported here also highlight a more general problem with recent attempts in the public sector to make schools and colleges more "accountable." A common practice these days is to require institutions to produce "performance" data such as retention rates, transfer rates, or mean scores of graduates on standardized tests. Such "outcome" measures, by themselves, tell us little about institutional performance or effectiveness. Indeed, they often can mislead policy makers into thinking that any institution whose absolute level of performance is below average is doing a "poor" job. Perhaps the most dangerous aspect of such an approach to accountability is that it provides negative incentives for institutions to enroll underprepared students, since such students tend to lower the institution's absolute level of outcome performance. By contrast, being able to compare actual outcome measures with expected measures based on student input characteristics provides a much more valid and useful basis for assessing institutional performance. We have already seen, for example, that some institutions with retention rates that look "good" in absolute terms are actually underperforming in relation to their student input characteristics, while others with "mediocre" rates are actually performing at a substantially higher level than one would expect from their student input characteristics.

In conclusion, when it comes to assessing institutional performance or accountability through the use of student outcome measures, there is really no substitute for longitudinal studies which permit us to take student input characteristics into account. Controlling for inputs is not merely a methodological nicety, but rather an absolute requirement in those cases where institutions are known to differ substantially in those entering student characteristics that predict the outcome(s) under investigation. The formulae and tables presented here are designed to enable institutions to do just this for one of our most-researched student outcome measures.

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Appendices

- Appendix A: Converting ACT scores to SAT Verbal and Math Equivalents

- Appendix B: Variables Used in regressions by racial subgroups

- Appendix C: Comparision of CIRP Retention Rates with Rates Reported by the American College Testing Program

Appendix A

Converting ACT Scores[a] to SAT Verbal and Math Equivalents

ACT Sum	SAT Verbal	ACT Sum	SAT Verbal	ACT Sum	SAT Verbal
108	800	77	540	46	360
107	800	76	530	45	350
106	800	75	520	44	350
105	800	74	510	43	340
104	800	73	510	42	340
103	800	72	500	41	330
102	800	71	490	40	320
101	790	70	480	39	310
100	770	69	480	38	310
99	760	68	470	37	310
98	750	67	460	36	300
97	740	66	460	35	300
96	730	65	450	34	290
95	720	64	440	33	280
94	710	63	440	32	280
93	700	62	440	31	270
92	690	61	430	30	260
91	680	60	430	29	260
90	670	59	420	28	250
89	660	58	420	27	250
88	640	57	410	26	240
87	630	56	410	25	230
86	620	55	400	24	230
85	610	54	400	23	220
84	600	53	390	22	220
83	590	52	390	21	210
82	580	51	380	20	210
81	570	50	380	19	210
80	560	49	370	18	210
79	550	48	370	17 or less	200
78	540	47	360		

ACT Math	SAT Math	ACT Math	SAT Math	ACT Math	SAT Math
36	780	24	510	12	360
35	750	23	500	11	350
34	730	22	480	10	340
33	710	21	470	9	330
32	700	20	460	8	330
31	680	19	450	7	320
30	660	18	440	6	300
29	640	17	430	5	290
28	610	16	410	4	280
27	590	15	390	3	270
26	560	14	380	2	260
25	530	13	370	1	240

[a] The ACT equivalent was obtained by summing three ACT subtests (English, Natural Sciences, Social Sciences) and converting to SAT equivalent by the equipercentile method (N=14,865). The sum of the three ACT subtests (range 3-108) was used (rather than simply ACT English subtest) because it resulted in a better correlation with the SAT Verbal score (r=.82 versus r=.69).

Appendix B

Variables Used in Regressions by Racial Subgroups

I. Inputs

A. Background

- Father's Education
- Mother's Education
- Parent's Income
- Student's Sex:Female
- Student's Age
- Student's Religion
  - *Catholic
  - *Jewish

B. Academic

- High School GPA
- SAT Verbal
- SAT Math
- Academic Rank in High School
- Years of High School Study: English
- Years of High School Study: Mathematics
- Degree Aspirations

C. Student Typologies

- Scholar
- Activist
- Artist
- Hedonist
- Leader
- Striver
- Uncommitted

D. Other Inputs

- Number Currently Dependent on Parents
- Distance from College to Home
- Concern about Financing College
- Political Views
- Self-Rating: Leadership Ability
- Self-Rating: Intellectual Self-Confidence
- Self-Rating: Social Self-Confidence

II. Bridge

A. Sources of Financial Aid

- Parental or Family Aid
- Savings from Summer Work
- Full-Time Job While in College
- Part-Time Job While in College
- Pell Grant
- Supplemental Educational Opportunity Grant
- State Scholarship or Grant

- •College Work-Study Grant
- •Other College Grant
- •Other Private Grant
- •Federal Guaranteed Student Loan
- •National Direct Student Loan
- •Other College Loan

B. Other Financial Aid Variables

- •Aid Awarded on Basis of: Academic Merit
- •Aid Awarded on Basis of: Financial Need
- •Aid Awarded on Basis of: Athletic Talent
- •Aid Awarded on Basis of: Other Talent
- •Aid Awarded on Basis of: Other
- •% of Aid from: Grants and Scholarships
- •% of Aid from: All Loans
- •% of Aid from: Work and/or Savings
- •% of Aid from: Parents and/or Spouse
- •% of Aid from: Other Sources

C. Undergraduate Student Majors

- •Agriculture
- •Biological Sciences
- •Busines
- •Education
- •Engineering
- •English
- •Health Professional
- •History or Political Science
- •Humanities
- •Fine Arts
- •Mathematics or Statistics
- •Physical Sciences
- •Social Sciences
- •Other Technical
- •Other Non-Technical
- •Undecided

D. First Year Living Arrangements

- •Plan to Live: Home
- •Plan to Live: Other Private Home, Apartment, Room
- •Plan to Live: College Dormitory

III. Institutional

A. Size

B. Selectivity

Appendix B (Con't)

C. Type/Control
- •Public University
- •Public 4-year College
- •Private University
- •Non-sectarian 4-year College
- •Catholic 4-year College
- •Protestant 4-year College
- •Historically Black College
- •Women's College

IV. Environment

A. Faculty Variables
- •% of Female
- •% of Ph D's
- •% of Science Faculty
- •mean: Faculty Morale
- •mean: Use of Active Learning
- •mean: Liberalism
- •mean: Time Stress
- •mean: Humanities Orientation
- •mean: Diversity Orientation
- •mean perceptual: Student Orientation
- •mean perceptual: Racial Conflict
- •mean perceptual: Lack of Student Community

B. Institutional Based Scores (Peer Measures)
- •Peer Mean: Intellectual Self-Esteem
- •Peer Mean: Materialism and Status
- •Peer Mean: Scientific Orientation
- •Mean Socio-Economic Status
- •% Whose Aid Based on Need
- •% Catholic
- •% Enrollment of Graduate Students
- •% of Total Expenditure: On Student Services

C. Curriculum Measures
- •Interdisciplinary Core
- •Comprehensive Required
- •Women's or Gender Course Required

V. Dependent Variable
- •Retention within Six Years

Appendix C

Comparison of CIRP Retention Rates with Rates Reported by the American College Testing Program

The following analysis was made possible through the courtesy of the American College Testing Program, which kindly made available a set of unpublished tables which formed the basis for the Chronicle article referred to earlier in the text (Chronicle of Higher Education, 1996). In evaluating these comparisons, the reader should keep in mind the following methodological differences:

- ACT data are based on institutional self reports of graduation rates, whereas the CIRP data are based on retention information provided by registrars on individual students.

- ACT data are average rates, which weight small and large institutions equally. CIRP data are population estimates of degree completion rates for all students, which weight institutions according to their size.

- ACT data are based on a 75 percent institutional response, and ACT made no corrections for possible response bias (i.e., the possibility that the institutions with lower rates would be less likely to respond). CIRP estimates adjust for possible sampling errors based on institutional type (four year versus unversity), control (public, private-nonsectarian, Roman Catholic), race (HBCU versus non-HBCU), gender composition, size, and selectivity level.

- ACT data are 5-year graduation rates, whereas CIRP data are 4-year and 6-year rates.

- ACT figures reported here were calculated from tables provided by ACT. More detailed ACT figures were callapsed into weighted averages to make comparison with CIRP possible (Table 16):

Comparison of CIRP Retention Rates with Rates Reported by the American College Testing Program

	ACT Estimates (Five-Year)	CIRP Estimates	
		Six-Year	Four-Year
Public Universities	47.7	39.9	34.4
Public 4-Year	42.5	37.3	30.6
Private Universities	66.2	71.5	69.2
Private 4-Year	55.6	49.2*	46.0*
All Institutions	53.2**	44.9	39.9

*Weighted average of three figures from Table 1. Weights based on number of institutions of each type in Fall 1984.
**Weighted average of four figures shown above.

The "All institution" figure that we computed from ACT data is highly inflated, since each one of the private institutions (which have higher retention rates and much smaller enrollments) is receiving the same weight as each public institution. The same may be true of the four ACT figures by institutional type and control, if (a) the larger institutions (and/or those with lower dropout rates) were less likely to respond to the ACT survey and/or (b) the larger reporting institutions within each category have above-average dropout rates. This latter possibility is consistent with our finding that size is negatively associated with degree completion (above).

The fact that CIRP estimates are higher only in the case of private universities no doubt reflects differences in definition: CIRP classifies only 69 private institutions as "universities," compared to 147 private "Ph. D." institutions as defined by ACT. If the nonuniversities within the ACT sample were reclassified as four-year institutions, the ACT degree completion rates for private universities would no doubt increase.

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